ECON 103: Statistics for Economists, Spring 2021

Syllabus

(Tentative: Jan. 11, 2021)

Course Instructor:

Wayne Yuan Gao
Email: waynegao@upenn.edu
Zoom Office Hours (tentative): Tuesday 9pm-10pm & Thursday 10am-11am
Zoom ID for Office Hours: https://sasupenn.zoom.us/my/waynegao

Lectures:

Live Lecture Time: Tuesday & Thursday, 12pm-1:30pm
Zoom Meeting ID: to be announced on *Canvas*.
Zoom lectures will be recorded and available on *Canvas* for on-demand viewing.

To prevent Zoom bombing, you will need to: (1) finish a one-time registration on Zoom using an invitation link posted on Canvas; (2) log into your Zoom account using your PennKey for each lecture.

Teaching Assistants:

Edvard Bakhitov: bakhitov@sas.upenn.edu
Desen Lin: desenlin@sas.upenn.edu
Sherwin Lott: lotts@sas.upenn.edu
Sean McCrary: smccrary@sas.upenn.edu
Kharis Sokolov: kharis@sas.upenn.edu
TA Office Hours will be announced later.

Recitation Sections:

201: Monday, 10-11am, Edvard Bakhitov
202: Friday, 9-10am, Kharis Sokolov
203: Monday, 12-1pm, Edvard Bakhitov
204: Friday, 10-11am, Kharis Sokolov
205: Monday, 11am-12pm, Sherwin Lott
206: Monday, 1-2pm, Desen Lin

Live Zoom recitation sections will be held during the designated time slots. Recitation sections will also be recorded and posted on *Canvas* for on-demand viewing. Please attend or watch the recording of the recitation sections that you are enrolled in. According to the university

administration, *"students should be aware that they have to attend their assigned recitation (if they don't, this will cause detrimental administrative issues regarding course data collection used for portfolios and accreditation)."*

Course Description:

This course will teach you how to learn from data and understand uncertainty using the ideas of probability theory and statistics. After completing this course, you will be able to carry out simple statistical analyses yourself on the computer package R. This course fulfills the College's Quantitative Data Analysis requirement.

Prerequisites:

The prerequisite for this course is multivariate calculus (Math 104 followed by Math 114 or Math 115). To do well in this course you will need to be comfortable with algebra, manipulating sums, differentiation and partial differentiation, solving unconstrained optimization problems, and integration.

Textbook:

The official textbook for this course is "*Introductory Statistics* (4th edition)", by Sheldon M. Ross, Elsevier. Digital copies of the textbook are freely available online via the Penn Library or the following webpage (PennKey login required): https://www.sciencedirect.com/book/9780128043172/introductory-statistics . While I suggest that you complete the assigned readings, my lecture slides, which will be posted online at the start of each week, are the final authority on course material. In particular, you are not responsible for material in the textbook unless it is also covered in lecture, but you are responsible for material from lecture even if it is not covered in the textbook.

Required Software:

We will use the statistical package R via a front-end called RStudio throughout the course. Both R and RStudio are open source and free. First, download and install R from http://cran.r-project.org/. Second, download and install RStudio by visiting https://rstudio.com/products/rstudio/download/ and clicking "Download" under the free RStudio Desktop version. You might need to further choose the right version for your operating system (Windows/Mac). You will be taught to use R through a series of tutorials. Additional R resources are listed on the last page of this syllabus. Make sure you download and start using R as the exams will involve coding and running some data analysis on R .

An invitation link for *free* access to *DataCamp*, an online learning platform for computer programming and data analysis, will also be sent out on Canvas. The platform allows you to learn

and practice R interactively on your web browser or mobile device. Homework assignment may contain R exercises on DataCamp.

Additional Resources for Learning R

R textbook (optional):*"The R Student Companion*", by Brian Dennis, if prefer a printed book to the free online resources listed below:
http://cran.r-project.org/other-docs.html
http://www.twotorials.com/
https://www.r-bloggers.com/how-to-learn-r-2/
http://cran.r-project.org/doc/contrib/Farnsworth-EconometricsInR.pdf
https://stats.idre.ucla.edu/r/

Course Website: Canvas

We will use *Canvas* to make course announcements, post course material, answer questions about course material and respond to private messages from individual students regarding personal issues. All written communication for ECON 103 should be directed to *Canvas*, *not* to the instructors' personal email accounts.

Discussion Board: Piazza

You are highly encouraged to the discussion board, *Piazza*, which is accessible via *Canvas* for Q&A about course material. By asking your questions and answering others' questions on *Piazza*, you create a positive externality: other students benefit from your questions/answers and you benefit from theirs. The instructor and TA's will actively moderate *Discussion*/*Piazza* on *Canvas* both to answer questions and approve (or correct) answers written by your fellow-students. In order to encourage participation, and reward the benefit that students bring to the discussion, I will award bonus points for participation in Piazza. This could be up to 5% of the final grade. Bonus points will be awarded for constructive questions, answers, and notes on Piazza. Even if you post anonymously to other students (but not to instructors: if you post anonymously to the instructors as well, I will not be able to recover your identity and award you bonus points), we can still award you bonus points for online participation. Bonus points are discretionary.

Departmental Course Policies:

All Economics Department course policies are in force in ECON 103 even if not explicitly listed on this syllabus. See https://economics.sas.upenn.edu/undergraduate/course-information/course-policies for full details.

Academic Integrity:

All suspected violations of the code of academic integrity as set forth in the Pennbook will be reported to the Office of Student Conduct. Confirmed violations will result in a failing grade for the course.

Grading:

Grades for this course will be determined based on 7 quizzes, 10 homework assignments, 2 take-home midterms, a comprehensive take-home final exam, face-to-face engagement, and Piazza bonus points:

$$\begin{aligned}\text{Course Score} = \quad & (20\% \times \text{Homework}) + (15\% \times \text{Quizzes}) \\ & + (20\% \times \text{Midterm 1}) + (20\% \times \text{Midterm 2}) + (20\% \times \text{Final}) \\ & + (5\% \times \text{"Face-time Engagement"}) + (5\% \times \text{Piazza Bonus})\end{aligned}$$

Homework:

Homework assignments will be posted on Canvas each week, starting from the third week of the semester. Homework will be collected and graded. Group work is encouraged, but you will have to submit your own answers. When calculating your homework average, I will drop your two lowest scores and weight the remaining homeworks evenly.

Quizzes:

There will be seven short, online quizzes roughly every other week. We will post the quizzes on Sunday night, and you will have 10 minutes to complete the quiz within a 24-hour window. Unless otherwise indicated, each quiz will cover all the material before, and including, the last lecture with higher weight given to material that was not tested in previous quizzes. When calculating your quiz average, I will drop your two lowest scores and weight the remaining quizzes evenly. There will be no makeup quizzes so be sure to use your two "free skips" carefully.

Exams:

There will be two midterms and a final exam. All will be take-home exams that you can work on for up to 4 days. You are free to use any resource, including the textbook, course notes, recordings, and even the internet to help you with your exam. However, you are not allowed to discuss the exam with any "human": this implies talking about the exam with your fellow students is not allowed, nor is posting on online discussion forums. In particular, you are not to email, text, call, chat, or talk to anyone about the exam except with me. There will be no make-up midterms: if you miss a midterm, its weight will be shifted towards your final exam.

Bear in mind that the final will typically be harder than the midterms. Sudden emergencies, of course, will be discussed and determined by the undergraduate chair.

Regrade Requests:

Exam regrade requests must be made in writing within a week of receiving your graded exam. As we re-grade the entire exam, your score could rise or fall. You may not discuss your answers with an RI or the instructor before submitting a regrade request.

"Face-time Engagement":

Face-to-face interactions might be one of the best features of in-person teaching that many of us miss in this time of online teaching and learning. While it is currently impossible to attain the level of face-to-face interactions in a physical classroom, I would like to be able to "see" every of you, and furthermore I want every one of you to be "seen" by your classmates as well. Hence, I will award five points of your course score based on the following forms of class participation:

(1) Sign up for a 10-minute private meeting with me. (2 points)

(2) Join my Zoom office hours and engage in an *active* discussion with me and other participants. (2 points)

(3) Sign up for a short *live* presentation of homework/exam problems in your recitation sections. If you are unable to attend live recitation sections due to time-zone differences, you may instead sign up for a short *recorded* presentation of homework/exam problems, which will be posted on the course website. (3 points)

(4) Sign up for a short *live or recorded* presentation of a discussion question assigned during my lecture. (3 points)

(5) Other opportunities to be announced later.

Of course, you will need to turn on your camera and allow us to *see your face* (unless you have legitimate reasons or strong personal preferences not to do so, in which case you will need to contact me to request an exception.) For each form of face-time engagement listed above, you may only earn the allocated points *once*. Slots for certain forms of face-time engagement will be spread out through the semester, and in each week only a limited number of slots can be accommodated, so please make sure to secure your spot while you can. More details about face-time engagement will be announced later.

Course Curve:

We typically try to target an average GPA in the range between 3.0 and 3.2, or slightly above a B average. In a nutshell, I will give about 30% As and A-s, 40-50% Bs and 20-30% Cs. If necessary, I will curve overall course scores (not individual assignments) so that they approximately fall into these ranges. I reserve grades below a C-minus for those cases in which a student fails to attain a minimum level of basic competence in statistics, an absolute rather than relative standard.

Course Schedule (Tentative)

Date	Day	Lecture	HW	Quiz
Jan. 21	Thu	Introduction		
Jan. 26	Tue	Summary Statistics: I		
Jan. 28	Thu	Summary Statistics: II	HW1	
Feb. 02	Tue	Basic Probability I		Q1
Feb. 04	Thu	Basic Probability II	HW2	
Feb. 09	Tue	Basic Probability III		
Feb. 11	Thu	Discrete Random Variables I	HW3	Q2
Feb. 16	Tue	Discrete Random Variables II		
Feb. 18	Thu	Discrete Random Variables III	HW4	
Feb. 23	Tue	Discrete Random Variables IV		Q3
Feb. 25	Thu	**No Lecture**		
		Feb. 25-28, Midterm 1		
Mar. 02	Tue	Continuous Random Variables		
Mar. 04	Thu	Sampling Distribution	HW5	
Mar. 09	Tue	Monte Carlo Simulation		Q4
Mar. 11	Thu	**Spring Break: No Lecture**		
Mar. 16	Tue	Estimation I		
Mar. 18	Thu	Estimation II	HW6	
Mar. 23	Tue	Confidence Intervals I		Q5
Mar. 25	Thu	Confidence Intervals II	HW7	
Mar. 30	Tue	**Engagement Day: No Lecture**		
Apr. 01	Thu	Hypothesis Testing I	HW8	
Apr. 06	Tue	Hypothesis Testing II		Q6
Apr. 08	Thu	**No Lecture**		
		Apr. 8-11, Midterm 2		
Apr. 13	Tue	Linear Regression I		
Apr. 15	Thu	Linear Regression II	HW9	
Apr. 20	Tue	Linear Regression III		Q7
Apr. 22	Thu	Linear Regression IV	HW10	
Apr. 27	Tue	Applications		
Apr. 29	Thu	Reserve Lecture		
		Tentative: May 7-10, Final Exam		

See the College's Academic Calendar for important dates such as deadlines for course selection, course drop, grade type change and course withdrawal.